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The North American species of *Psilogramme**

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In describing not long ago a new and peculiar species of *Psilogramme* from Porto Rico, it became apparent that the other North American members of the genus (mainly Costa Rican), though treated recently,† were not well understood. Still more recently an apparently undescribed species has been received from Chiapas, extending widely the known continental range of the genus. This has led to a further examination of the entire genus, with particular regard to the North American species. Some of the notes taken are given under the following provisional list of species now reported from North America. The sequence is essentially that of Kuhn's classification.‡

KEY TO THE SPECIES

Veins extending to the emarginate apex of the ultimate divisions.

Fronds erect, obviously determinate; laminae narrow, the primary rachis straight or subflexuous; primary pinnae short, 3 to 8 cm. long.

Rhizome very slender (1 to 2.5 mm. thick), wide-creeping, the fronds 1 to 2.5 cm. apart.....1. *P. Warscewiczii*.

Rhizome thick, ascending or decumbent, the fronds fasciculate.

Lamina pale yellowish or grayish green, densely spreading-villose throughout; pinnae rigidly herbaceous, crowded.....2. *P. congesta*.

Lamina bright green, laxly glandular-hirsute; pinnae membrano-chartaceous, distant or subdistant.....3. *P. chiapensis*.

Fronds very much larger, scandent or recumbent, tardily determinate; lamina ample, the primary rachis widely sinuose-flexuose or strongly divaricate-flexuose; primary pinnae greatly elongate, mostly 12 to 25 cm. long.

Secondary pinnae all very sharply retrorse in attachment but at once curved upward, glabrous throughout; ultimate divisions 1.5 to 2 mm. broad.....4. *P. glaberrima*.

Secondary pinnae retrorse only at a broad angle or spread-

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† Christ in Bull. Herb. Boiss. II. 4: 1096-1099. 1904.

‡ Gruppe Chaetop. 13-22. 1882.

ing, not recurved, variously pubescent; ultimate lobes 1 mm. broad, or mostly much less.

Leaf tissue copiously short-villose upon both surfaces. 5. *P. villosula*.
Leaf tissue scantily pubescent.

Segments minute, the ultimate fertile lobes mostly about 1 mm. long, less than 1 mm. broad, sparsely and laxly pubescent upon both surfaces, or hairs more numerous among the sporangia... 6. *P. haematodes*.

Segments larger, the lobes longer and broader, widely divaricate, glabrous above, bearing a few short hairs beneath among the sporangia... 7. *P. refracta*.

Veins not attaining the margin; teeth of the ultimate segments not emarginate..... 8. *P. portoricensis*.

I. PSILOGRAMME WARSCIEWICZII (Mett.) Kuhn, Gruppe Chaetop.
17. 1882.

Gymnogramma Warscewiczii Mett. Ann. Sci. Nat. Bot. V. 2:
211. 1864.

TYPE LOCALITY: Cartago, Costa Rica (*Warscewicz*).

DISTRIBUTION: Costa Rica and Colombia, ascending to 3,000 meters.

ILLUSTRATION: Karsten, Fl. Columb. 2: pl. 188, f. 3 (as *G. Warscewiczii*).

Psilogramme Warscewiczii was described by Mettenuis upon two collections, one from the Páramo San Fortunato, Colombia, altitude 2,800 meters (*Lindig 299*), the other from Cartago, Costa Rica (*Warscewicz*); the latter must be regarded as the type. The original description, which is very complete, points unmistakably to the common Costa Rican plant redescribed by Christ erroneously as *Gymnogramme hirta* Desv. It is true that *P. hirta* and *P. Warscewiczii* are similar in stature and cut of frond. The former species, however, has the numerous fronds closely fasciculate upon a very short rhizome, and the lamina conspicuously hispid or hirsute with stiff spreading hairs; whereas in *P. Warscewiczii* the fronds are borne singly, an inch or more apart, upon a slender, very widely creeping rhizome, and the lamina is inconspicuously short-villous along the rachises and veins, with lax appressed hairs. The stout stipes and generally sturdy appearance of *P. Warscewiczii* are equally characteristic. Karsten's figure, above cited, agrees well with Costa Rican material and differs only in representing a plant slightly above the maximum of the following specimens examined.

COSTA RICA: Volcán de Poás, altitude 2,300 to 2,644 meters, *J. D. Smith* 6930 (3 sheets); *Tonduz* 10712; *Alfaro* 121. Volcán de Turrialba, alt. 3,000 meters, *Pittier* 13256 (*J. D. Smith* 7488).

2. ***Psilogramme congesta*** (Christ) Maxon.

Gymnogramma congesta Christ, Bull. Herb. Boiss. II. 4: 1098. 1904.

TYPE LOCALITY: Forests of La Palma, Costa Rica, altitude 1459 meters (*Tonduz*).

DISTRIBUTION: Costa Rica, at altitudes of 1,300 to 1,500 meters.

This species has been very well described by Christ. It has the short rhizome, closely fasciculate fronds, and conspicuous spreading hispid covering of true *P. hirta*, but the rigidly erect fronds and sturdy appearance of *P. Warscewiczii*, a species which otherwise it does not closely resemble. The almost grayish, strongly hispid aspect of the plant has been mentioned by Christ. This feature, the close-set pinnae and pinnules of all the fronds, and the peculiarly strict and narrow appearance of the segments of the sterile fronds are the best distinctive marks of this excellent species.

COSTA RICA: Forêts de La Palma, alt. 1,300 to 1,459 meters, *Tonduz* 12575; *Brade*. La Hondura, near La Palma, alt. 1,500 meters, *Jimenez* 594; *Werckle* 16683. Without locality, *Werckle* (ex herb. Christ).

3. ***Psilogramme chiapensis*** Maxon, sp. nov.

Rhizome apparently short, decumbent, freely radicle beneath and at the sides, bearing at the apex numerous dark reddish brown, opaque, rigidly acicular, simple hairs, these 1.2 to 1.8 mm. long, consisting of 10 to 16 cells above the enlarged multicellular base; fronds about 6, fasciculate, 40 to 57 cm. long, erect-arching; stipe 20 to 25 cm. long, 1.3 to 2 mm. in diameter, dark brown from a purplish brown base, lustrous beneath a sparse subpersistent covering of lax multicellular simple brownish hairs; lamina linear-oblong or linear-deltoid to lanceolate, acuminate, 22 to 34 cm. long, 8 to 11 cm. broad, bipinnate-tripinnatisect, the primary rachis similar to the stipe, lightly angled, subflexuous in the apical half; larger primary pinnae about 10 pairs, slightly ascending, the lowermost 2 to 4 pairs opposite or nearly so, these the largest, 5 to 8 cm. long, 2 to 3.5 cm. broad, inequilateral, narrowly deltoid

or triangular-oblong, subacute, subfalcate, fully pinnate in the basal part, the subflexuous secondary rachis elsewhere narrowly foliaceous-marginate, densely clothed with spreading multicellular hairs, these with a darkish terminal gland; pinnules 6 to 10 pairs below the short, cleft or parted apex, mostly spreading, the basal pair slightly the largest or the 3 or 4 basal pairs subequal, regularly pinnatisect to the foliaceous costa, laxly hirsute upon both surfaces, more copiously so beneath, the hairs mostly gland-tipped; segments 2 or 3 pairs below the obtuse usually tripartite apex, mostly oblique, the larger ones inequilateral, obovate or trapeziform from a narrowly cuneate base, obliquely cleft into 2 or 3 lobes, these mostly bilobate at their tips; smaller segments narrower, cuneiform, strongly decurrent, only 2 or 3-lobed; veins very slender, dark brown above, subdichotomous, the 2 to 8 ultimate branches of each segment terminating at the faintly emarginate apices of the lobes; sporangia very numerous, falling short of the tips of the lobes but extending nearly to the base of the segments, the lines widely confluent at maturity. Leaf tissue yellowish green, delicately membrano-chartaceous.

Type in the U. S. National Herbarium, no. 464844, collected upon the Cerro del Boqueron, Chiapas, Mexico, September, 1913, by Dr. C. A. Purpus (*no.* 6722). A second and excellent sheet of three fronds of the same number is at hand; also a later collection from Chiapas (*Purpus* 7219).

Related to *P. hirta* and *P. glandulosa* of South America; differing from the former in its narrower, fewer-veined segments and its scantier, obviously glandular pubescence; and from the latter very conspicuously in the much greater size and subdivision of the lamina.

4. *Psilogramme glaberrima* Maxon, sp. nov.

A weakly scandent or recumbent plant, the elongate fronds lax, probably of tardily determinate growth. Rhizome and stipe wanting in the material at hand; lamina apparently 1.5 to 2 meters long, 40 to 50 cm. broad, narrowly oblong, tripinnate-quadrupinnatisect, the segments of the fourth order 1 to 3 times divaricately dichotomous; primary rachis slender (1 mm. thick), sinuous-flexuous, brownish castaneous, highly lustrous, perfectly glabrous; primary pinnae alternate (those of the same side about 12 cm. apart), slightly ascending at their point of origin but lax, apparently drooping, orbicular-deltoid, 20 to 25 cm. long, 15 to 20 cm. broad, the lustrous glabrous castaneous secondary rachis sharply flexuous; secondary pinnae 4 or 5 pairs, contiguous,

petiolate, all sharply retrorse in attachment but immediately curved upward, thus spreading or mostly ascending, the basal ones the largest, these deltoid-oblong, 9 to 11 cm. long, about 5 cm. broad, consisting of about 5 pairs of spreading, mostly inequilateral, obtuse, deltoid-oblong, deeply pinnatisect pinnules; tertiary rachises castaneous nearly throughout, narrowly foliaceo-marginate in the middle, or widely so toward the apex of the secondary pinnae; segments of the larger pinnules mostly once or twice dichotomous, the divisions divaricate, mostly simple, 2 to 5 mm. long, 1.5 to 2 mm. broad, slightly broader than the widely foliaceous rachises of the pinnules; veins solitary, evident, very slender, brownish, extending to a very narrow but deep sinus in the rounded apex of the lobe; sporangia dark brown, very numerous, those of two (rarely more) adjacent lobes joined at the base. Leaf tissue membrano-papyraceous, grayish green, fragile; hairs wholly lacking throughout, even among the sporangia.

Type in the U. S. National Herbarium, no. 827510, collected in the forests of La Palma, Costa Rica, altitude 1,459 meters, September 4, 1898, by A. Tonduz (*no.* 12531). Collected also at the same place by Brade (March 17, 1908) and by the writer (*no.* 398, May, 1906), these specimens smaller than the type collection but otherwise identical. A specimen collected by Wright at Omotepec, Nicaragua, while upon the North Pacific Exploring Expedition, is certainly the same.

Psilogramme glaberrima apparently lacks any very near relatives. In several respects it somewhat resembles *P. Orbignyana*; namely, in habit, in its flexuous secondary rachises, and in the position and curvature of its secondary pinnae, these arising retrorsely but being immediately curved and directed forward. The resemblance ends here, however, *P. Orbignyana* having numerous veinlets to the ultimate segments.

5. *Psilogramme villosula* Maxon, sp. nov.

Rhizome wanting; fronds suberect, apparently 40 to 60 cm. long; stipe incomplete, 2 to 2.5 mm. in diameter, woody, dark castaneous, sublustrous, glabrescent; lamina oblong, apparently 30 to 40 cm. long, 12 to 25 cm. broad, tripinnate or almost quadri-pinnate, the pinnules further divided; primary rachis similar to the stipe, subpersistently short-villose with a thin covering of short multicellular yellowish flattish hairs; primary pinnae alternate, arising at an angle of about 45°, then recurved, deltoid-oblong, acute, 8 to 15 cm. long, the secondary rachis subflexuous,

densely short-villose; secondary pinnae approximate or mostly apart, short-petiolate, deltoid-oblong, the basal ones reflexed, up to 4.5 cm. long, the others spreading; pinnules 4 or 5 pairs, spreading or slightly reflexed, rounded-triangular or narrowly subovate in outline, the larger ones cut to the narrowly marginate costa, with about 2 pairs of deeply cleft dichotomo-flabellate segments, the ultimate divisions 1 to 1.5 mm. long and about 1 mm. broad, their tips narrowly emarginate to the slender brownish vein; leaf tissue delicately herbaceous, together with the rachises and costae densely short-villose beneath, more sparsely so above, the hairs similar to those of the primary rachis or a little longer and stiffer; sporangia very numerous, usually borne throughout the veins of the segments and almost wholly covering the leaf surface, with numerous hairs intermixed.

Type in the U. S. National Herbarium, no. 471992, collected upon the Cerro de las Vueltas, Costa Rica, altitude 3,000 meters, January, 1897, by H. Pittier (*no. 10502*). A second sheet of this collection contains two laminae which are smaller but otherwise identical.

This, which is a very distinct species, is founded upon one of the two members cited by Christ* as representing *Gymnogramme Warscewiczii*; but it agrees not at all either with Mettenius's excellent description or with Karsten's later illustration. The second specimen cited by Christ (El Páramo, région du General, *Pittier 10452*) is probably still another species.

6. ***Psilogramme haematodes*** (Christ) Maxon.

Gymnogramma haematodes Christ, Bull. Herb. Boiss. II. 4: 1097. 1904.

TYPE LOCALITY: Summit of Volcán de Poás, Costa Rica, altitude 2,644 meters (*Tonduz 10713*).

DISTRIBUTION: Upper slopes and summits of the volcanoes Poás, Barba, Irazú, and Turrialba, Costa Rica, altitude 2,400 to 2,644 meters.

This species, well described by Christ, is exceedingly well marked by its minute, short, slightly pubescent, close-set ultimate segments. It can hardly be confused with any North American species, except possibly the plant here listed as *P. refracta*.

COSTA RICA: Summit of Volcán de Poás, alt. 2,644 meters,

* Bull. Herb. Boiss. II. 4: 1098. 1904.

Tonduz 10713. Volcán de Irazú, alt. 2,400 meters, *J. D. Smith 4999*. Forêts du Barba, *Pittier 1936*. Volcán de Turrialba, alt. 2,500 meters, *Alfaro 52*.

7. **Psilogramme refracta** (Kunze) Maxon.

Gymnogramma refracta Kunze; Klotzsch, *Linnaea* **20**: 410. 1847.

Anogramma refracta Fée, *Gen. Fil.* 184. 1852.

TYPE LOCALITY: Sierra Nevada, Colombia (*Moritz 359*).

DISTRIBUTION: Colombia and Costa Rica, ascending to 2,300 meters.

ILLUSTRATION: Fée, *op. cit. pl. 19. A. f. 2* (as *A. refracta*).

The present species is here determined solely from the original description and the small detailed figures by Fée. Without an examination of the Moritz type specimen it cannot be shown positively that Kuhn erred in referring this form to *P. flexuosa*, yet from the data at hand this seems almost certain. In any event, the Costa Rican plant mentioned below is not referable to *P. flexuosa*. Of published species it seems to agree only with the South American *P. refracta*; and if it is not really of that species it must subsequently be described as new. Its distinctive characters are indicated in the key.

COSTA RICA: Volcán de Poás, province of Alajuela, alt. 2,300 meters, March, 1896, *J. D. Smith 6931* (3 sheets).

8. **PSILOGRAMME PORTORICENSIS** Maxon, *Contr. U. S. Nat. Herb.*

17: 412. 1914.

TYPE LOCALITY: Extreme summit of El Yunque, Porto Rico, altitude 1,110 meters.

DISTRIBUTION: Known only from the type collection (*Hioram 348*).

ILLUSTRATION: *Contr. U. S. Nat. Herb.* **17**: *pl. 15*.

One of the smallest species of the genus, and the only North American member of the group in which the veinlets do not extend to emarginate apices of the teeth. It has previously been compared with *P. hispidula* (Klotzsch) Kuhn, which is probably its nearest relative.

EXCLUDED OR DOUBTFUL SPECIES

PSILOGRAMME DOMINGENSIS (Baker) Underw. Bull. Torrey Club
29: 628. 1902.

Gymnogramme domingensis Baker, Ann. Bot. 5: 485. 1891.

TYPE LOCALITY: Alto Causal, Santo Domingo, altitude about 2,100 meters.

DISTRIBUTION: Known apparently only from the type collection.

It is impossible to determine from description whether this species, transferred to *Psilogramme* by Underwood, properly belongs to that genus. Not only is the description incomplete, but the rhizome is said to be wanting in the type specimen.

PSILOGRAMME SCHIZOPHYLLA (Baker) Underw. Bull. Torrey Club
29: 629. 1902.

Gymnogramme schizophylla Baker, Jour. Bot. 15: 266. 1877.

Anogramma schizophylla Diels in Engl. & Prantl, Pflanzenfam.
14: 258. 1899.

TYPE LOCALITY: Old England, Jamaica (*Miss Taylor*).

DISTRIBUTION: Several localities in the Blue Mountains, Jamaica, altitude 1,200 to 1,500 meters; reported also from Cuba.

ILLUSTRATION: Hook. Icon. Pl. pl. 1682 (as *Gymnogramme schizophylla*).

This is a peculiar species whose proper disposition is doubtful. From its broad deltoid scales it is assuredly no member of *Psilogramme*, and its reference to *Anogramma* by Diels is scarcely more satisfactory. Of recognized genera it is nearest to *Pityrogramma* (*Ceropteris*) and may perhaps belong to that.